Comparison Of Supine And Sitting Positions Cervical Traction On Cardiovascular Parameters, Pain And Neck Mobility In Patients With Cervical Spondylosis

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Citation

S R AKINBO, M A DANESI, D A OKE, C B AIYEJUSUNLE, A A ADEYOMOYE. *Comparison Of Supine And Sitting Positions Cervical Traction On Cardiovascular Parameters, Pain And Neck Mobility In Patients With Cervical Spondylosis*. The Internet Journal of Rheumatology. 2013 Volume 8 Number 1.

Abstract

Objective: This study investigated the cardiovascular responses and side effects during cervical traction (CT) in sitting and supine positions; and also to compare the effects of both positions on pain and neck mobility in patients with cervical spondylosis.

Methods: One hundred (100) patients were assigned into two groups (A and B) with 50 patients in each group. Group A patients were treated with CT in supine position, Transcutaneuos Electric Nerve Stimulation (TENS), massage and exercise, so also were patients in Group B, but the CT was applied in sitting position. Cardiovascular parameters, PR interval and QRS complex were assessed and analysed during CT for 15 minutes. Pain intensity and neck mobility were also assessed and analysed for 4 weeks. Analysis of variance (ANOVA) and post-hoc test were used to determine significant difference in the cardiovascular and ECG parameters. Man - Whitney U test was used to compare mean pain intensity between the two groups, while Wilcoxon signed ranks test was used to compare mean pain intensity within the same group. Also t-test was used to analyse significant difference for cervical mobility. The level of significance was put at $P < 0.05$

Results: The study reveals similar direction of cardiovascular (SBP, DBP and RPP) alterations in both positions during CT ($P<0.05$). The HR and selected ECG variables were not significant throughout the traction periods ($P>0.05$). Twenty four (9 and 15 in supine and sitting positions CT respectively) patients experienced different side effects during CT application, with the neck muscle tenderness the mostly occurred in the two groups. Also, the study reveals the effectiveness of the two traction positions in terms of pain relief and enhance neck mobility in the subjects studied. But the supine CT position recorded a higher mean difference.

Conclusion: Findings from the study supports the use of either the supine and sitting positions CT in the management of patients with cervical spondylosis, but the supine position proved to be a better option.

INTRODUCTION

The astounding rise in computer use all over the world in the last decade has been parallel by rise in work-related musculoskeletal disorders with symptoms of neck pain and stiffness as a result of cervical spondylosis due to repetitive typing or keyboard entry.[1]

The incidence of cervical pain survey in the USA has increased tremendously in the last decade with over 70% of the cases traced to repetitive computer usage. [2] This development has also increased the incidence of degenerative disorder of the spine in form of low back pain and upper back (neck) pain. [2] The computer induced neck pain is an acute pain which in most cases may lead to chronic pain (cervical spondylosis) if poorly managed and with the repetitive use of the computer, which may be complicated by poor sitting posture during computer or musical keyboard operations. [2]

Management of neck pain of musculoskeletal origin is commonly by analgesic drugs, mostly the nonsteriodal anti-inflammatory drugs (NSAID), muscle relaxant, and physiotherapy. Analgesic drugs has been reported to offer short time pain relief to most of the patients with neck pain.[3] The pain is reported to relapse even in greater severity, 2-3 weeks post drug administration in most of the patients.[3] Therefore, physiotherapy has been reported to offer long-lasting and better pain relief to most of the patients compared with drug.[3] Physiotherapy modalities

commonly used in managing this disorder are thermal therapy, cryotherapy, therapeutic ultrasound, therapeutic exercise, Transcutaneous Electric Nerve Stimulation (TENS), and cervical traction. Cervical traction (CT) combined with thermal therapy and TENS has been established to be an effective approach in managing most types of neck pain of musculoskeletal origin. [4-6]
Cervical traction applies a stretch to muscles, ligaments, and tissue components of the cervical spine. It provides relief by promoting separation of the intervertebral joint space, which contains the disc and may reduce a "bulge" or impingement of structures within the foramen.[4, 7]
Cervical traction force is usually applied to the skull through a series of weights or a fixation device, and requires that the patient is either kept in supine position[5, 8, 9] or placed in a halo vest or sitting position.[10,11] Cervical traction may also be applied continuously or intermittently.[12]
There is currently no consensus among the clinicians regarding the best CT position to be employed during treatment that will offer the maximal pain relief with minimal side effects. Some clinicians prefer to administer CT in supine position because it is believed that a patient is maximally relaxed in this position than in sitting position.[8] Other asserted that the sitting position offers a better tractive force needed. [10,11] Colachis & Strohm[8] suggested that patients might be more relaxed and less tense in the supine position CT, while Maitland[11] reported that the sitting position is a better option, in that it offers greater glutea and spinal support, especially when sitting in a slightly slumped position.
Cervical traction is suspected to induce side-effects such as severe pain in the neck and arm (brachialgia) during traction application, weakness not due to overexertion (lassitude), a sensation of lack of balance or equilibrium (vertigo), a feeling of impending vomiting (nausea), mild headache, blurred vision, and migraine, most of which suggest a perturbation of the patient's cardiovascular system (CVS).[3, 4, 13] These side effects have led some clinicians to consider CVS or cardiorespiratory problems as a contraindication to CT therapy, and have also informed a reduction in its frequency of use by clinicians despite its established benefits.[4, 14] However, these acute effects of CT on the CVS during traction application remain speculative and unquantified.
This study therefore aims to investigate the cardiovascular responses and side/adverse effects during CT in sitting and supine positions (safety): and also to compare the effects of both positions CT on pain intensity and neck mobility (efficacy) in patients with cervical spondylosis.

PATIENTS AND METHODS

Subjects' Selection.
One hundred (100) subjects, (47 males and 53 females) with mean ± standard deviation (X±SD) age male and female; 47.4 ± 8.8 and 43.5 ± 7.4 years respectively, were medically screened to take part in the study. These were patients diagnosed with cervical spondylosis, as confirmed by a radiological report, and referred to Physiotherapy Clinic at the Lagos University Teaching Hospital (LUTH), Lagos Nigeria, for neck pain as a result of cervical spondylosis. The subjects were assigned into two groups; A and B through balloting, that is, a box containing either A or B paper were provided, and as patient were recruited either of the paper was picked. Each of the group comprises of 50 subjects.
Group A (supine position CT); Subjects in this group were treated with TENS, therapeutic exercise, massage and supine position CT
Group B (sitting position CT); Subjects in this group were treated with TENS, therapeutic exercise, massage and sitting position CT.
Inclusion criteria are subjects with no obvious cardiovascular or cardiorespiratory ailment following proper screening by the physician and subjects with no previous experience of CT.
Exclusion criteria are subjects with structural disease or condition affecting the bones of the spine e.g. malignant lesion, osteoporosis and tuberculosis, and subjects with history of injury to the spine e.g. fracture or trauma to the spine, unstable spinal joint, dislocation or subluxation to the spine and/or shoulder. Also excluded were subjects with hypotension

Informed Consent and Ethical Approval
Prior to the commencement of the study, subjects were informed of research procedures and each volunteered to be included in the study by signing an informed consent. The approval of the College of Medicine, University of Lagos, and Lagos University Teaching Hospital, Research and Ethics Committee was sought and obtained before the commencement of the study

Research Procedure
Cross-over study design with the subjects serving as their own control in the supine and sitting CT positions was used. Subjects were educated concerning the research procedure

and were introduced to the equipment. Subjects' weight and height were measured to determine the traction weight. A brief history of the origin and duration of the pain, and any associated problems was obtained from subjects. Assessment and examination of the neck for each fresh referral was conducted to establish the painful areas. Palpation and localisation of the painful areas was by mild thumb/digital pressure on the spinous process of the cervical spine and upper back region.

A cervical mobility test (cervical movements in flexion, extension, lateral/side flexion and rotation in degrees) was done adopting Luttengens and Hamilton[15] procedure, using the universal goniometer (Lafayette Instrument Co. Inc model 01135). Movement eliciting pains were noted. Intensity of pain was assessed using the visual analogue scale (VAS) and modified verbal rating scale (MVRS).[16, 17] The VAS and MVRS are pain rating scales that allow the patient to describe his or her pain intensity in term of numbers. These scales are graded from 0 – 10. They are progressive scales with the numbers being positively related to the pain intensity. Thus, 0 represents a situation of no pain, while 10 represents the most excruciating pain level. The MVRS is the indigenous (local) language version of the VAS for subject that could not communicate in English language.

The 10% total body weight (TBW) CT was utilised. Pre-treatment cardiovascular variables, systolic blood pressure (SBP), diastolic blood pressure (DBP), heart rate (HR), rate pressure product (RPP), and ECG (KENZ 201 model) readings (PR interval and QRS complex), were evaluated in order to establish baseline values for each subjects. Rate pressure product is a useful index of cardiac stress and is known to be a valid predictor of the myocardial oxygen consumption at rest and during exercise. This was evaluated using the formula; RPP = SBP x HR[18]

Guthrie Smith Suspension Unit (Modern Gym model) traction machine was used. As the head halter and the external weight applied hinder the ability of subjects to communicate, a hand signal was arranged to enable the subjects terminate the treatment or respond at a specific period in case of the development of any discomfort during the traction application. Treatment can also be terminated if the cardiovascular alteration goes beyond critical normal range during traction therapy. The supine and sitting positions CT procedures described by Nwuga[5] and Zybergold & Piper[10] were utilized, respectively.

Cervical traction was administered either in sitting or supine positions for 15 minutes. The cardiovascular and ECG responses were assessed at baseline, the end of 10, and 15 minutes, respectively for each treatment session to assess responses and safety for each of the position during CT procedure. At the end of each CT session, the traction weight was removed and recovery cardiovascular responses monitored again till the initial baseline values are attained. Subjects were also evaluated concerning discomforts during or after the traction. ECG was recorded according to the recommendation of the American Heart Association.[19] The results were analysed by a cardiologist.

At the end of every traction application, all subjects were treated with dual channel TENS machine (ES – 320), therapeutic exercise, and massage. Assessment of pain intensity and cervical mobility were done at baseline and at the end of every week till the end of fourth week treatment session (post treatment).

TENS was administered in prone position with two pairs of self-adhesive electrodes placed around the painful region for each patient. High frequency TENS was applied at 100Hz and 250s pulse rate and pulse width, respectively. The intensity was adjusted to a tolerable level of stimulation. The treatment lasted for 15 minutes for each patient.

Exercise therapy was administered to all subjects, using neck strengthening exercises, neck and shoulder stretching exercises in prone and supine positions. Simple soft tissue massage on the painful area was given to each subject at the end of every traction therapy session.

Each subject had two treatment sessions per week for four uninterrupted weeks. The treatment duration per session of treatment was between 45minutes to one hour excluding assessment.

Computation and Data Analysis

The mean cardiovascular responses and ECG recording at baseline position, end of 10 minutes and 15 minutes were computed at the end of every week from the beginning to the fourth week, so also are the side effects associated with the two traction positions. The mean pain intensities and the cervical range of movement pre-treatment, and at the end of every week, for the durations of the study, and were evaluated and recorded.

Obtain data was analyzed using a statistical package (SPSS-PC, Version 7) design for window based IBM Compatible Computer. Descriptive statistics of mean (X) and standard deviation (SD) was used to summarize the demographic data of the subjects. Analysis of variance (ANOVA), and post-hoc test using Tukey LSD were employed to determine significant differences in the cardiovascular and ECG parameters between the baseline and the different experimental phases (baseline, end of 10, and 15 minutes successively) within the same group for the two positions. Man - Whitney U test was used to compare mean pain intensity between the two groups, while Wilcoxon signed ranks test was used to compare mean pain intensity within the same group, that is between pre and post treatment pain score within the same group. The t-test was used to analyse differences within the same group and independent t-test between the two positions for cervical mobility. The level of significance was put at $p < 0.05$

RESULTS

General Observation

One hundred (100) subjects went through balloting procedure for the study. They were allocated into two groups (A and B) with 50 subjects in each group. The subjects were screened thereafter; but only 81 were eligible. Nine and 10 patients in group A and B, respectively were drops because they did not meet the inclusion criteria. Of the eligible subjects, only 78 completed (40 and 38 for groups A and B, respectively) the study. Three patients dropped-out because they were unable to tolerate the traction, due to unbearable pain during the traction procedure.

Subjects in the two groups had similar demographic characteristics. Statistical analysis (t-test) was used to ascertain the homogeneity of the anthropometry variables (age, weight, height and BMI) (Table 1).

Cardiovascular and Selected ECG Responses

There was a drop in the blood pressure {systolic (SBP) and diastolic (DBP)}, and myocardial oxygen consumption {rate pressure product (RPP)} from the baseline in the two groups during the application of the CT. Analysis of variance comparing the baseline cardiovascular variables with the two phases (end of 10 and 15 minutes) during the traction therapy in the two positions reveals decreases in the SBP, DBP, and RPP, on the application of the traction. The decreases demonstrated significant differences ($P<0.05$) for both groups from the beginning to the end of the study (end of first week to the end of fourth week). The pos-hoc test shows that the significant difference lies between baseline & end of ten minutes, and baseline and end of fifteen minutes for the duration of the study (Table 2).

The changes in the heart rate (HR) were not statistically significant ($P>0.05$) in any of the groups, comparing the baseline values with the two experimental phases throughout the duration of the study (Table 2). The ECG variables (PR interval and QRS complex) were relatively stable, though with very mild alterations in the two groups throughout the 15 minutes traction duration. The values were within the normal adult recordings of 0.12-0.20 sec for PR interval and 0.06-0.10 sec for QRS complex. Statistical analysis did not show any significant difference ($p> 0.05$). This result signifies that the cardiac muscles were not adversely affected by any of the traction weights during the traction application.

Side Effects Associated With The Different Cervical Traction Weights

Twenty four (29.6% of total) subjects (9 and 15 in groups A and B respectively) had various complaints (side effects) during the traction application. Twenty two (22%) percent and 37.5% of the total subjects in groups A and B had complaints during the traction. Traction treatments was terminated in three subjects (one and two subjects in group A and B respectively) during traction because of unbearable/severe pain, hence they could not complete the study (Table 3).

Neck Pain

All the subjects reported different pain intensities pre-treatment in the two groups. The intensity ranges from moderate to severe. Findings from the results reveal that the reported intensities of pain in the two groups decreased significantly, ($P<0.05$) comparing pre and post-treatment scores within each group. There was no significant different in the pre-treatment pain scores between the two groups, but there was significant differences in the post-treatment scores ($p<0.05$). The mean difference between pre-treatment and post-treatment in the two groups are 5.4 and 4.5, for group A and B respectively; meaning that group A has a higher mean difference. The implication of this is that supine position offers better pain relief.

A significant difference also existed comparing the pre- and post-treatment pain scores within each group (for both groups), using the Wilcoxon signed ranks test (Table 4). The implication of this is that both positions offer pain relief.

Cervical Mobility (Range of Movement, ROM)

All the subjects had neck stiffness with associated pain of different severity during cervical movements (flexion, extension, lateral/side flexion, and rotation) at the beginning of the study (pre-treatment). Statistical analysis using t-test did not establish a significant difference between the two groups pre-treatment. Analysis of mobility in the two groups, that is between post and pre-treatment within the same group established significance differences in the four neck mobility tests. This signifies that both positions are effective in the management of neck stiffness as a result of cervical spondylosis (Table 5).

Table 1

Demographic Characteristics of Subjects

Variables	Group A		Group B		Total	P-value
	n=41	Range	n=40	Range		
Age (Years)						
Male n= 38	47.5 ± 9.0	36-61	47.2 ± 8.6	34-64		0.889
Female n= 43	43.9 ± 6.2	35-59	43.1 ± 8.5	32-57		0.900
X±SD	45.7± 8.6		45.2± 8.1			0.900
30 – 39	10		9		19	
40 – 49	14		14		28	
50 – 59	11		11		22	
60 & above	6		6		12	
Total	41		40		81	
Body Weight (Kg)						
Male n= 38	72.9 ± 10.4	56-81	74.3 ± 9.3	58-79		0.690
Female n= 43	75.2± 11.5	54-77	74.0 ± 8.7	52-75		0.587
Height (meter)						
Male n=14	1.67 ± 0.47	1.53 -1.80	1.68 ± 0.35	1.54-1.78		0.956
Female n=16	1.65 ± 0.26	1.51-1.75	1.66 ± 0.16	1.54-1.75		0.910
Body mass index						
Male n=38	26.04± 5.6		26.54± 5.8			0.900
Female n=43	27.85± 6.0		26.43± 5.6			0.895
X±SD	26.95± 5.9		26.49± 5.7			0.900

*Indicating a statistically significant difference at p <0.05

Table 2

Statistical analyses (ANOVA & Post-hoc) of cardiovascular and selected ECG responses of the patients in the two groups during CT application

Group A (X ± SD) n = 41

Cardiovascular & ECG Parameters	BL(1)	10mins(2)	15mins(3)	F	P-value	PH
the end of 1st week						
SBP mmHg	127.4 ± 8.6	115.8 ± 6.3	118.5±6.7	20.585	<0.0001*	1&2,1&3
DBP mmHg	85.5 ± 6.9	76.2 ± 5.2	76.7±5.5	25.075	0.001*	1&2,1&3
HR beats/min	78.0 ± 8.1	76.8 ± 8.7	77.3±8.5	0.287	0.056	
RPP X10²	99.4 ± 7.9	88.7 ± 6.9	91.6±7.3	23.063	0.001*	1&2,1&3
PR interval X10² sec	8.5 ± .14	8.3 ± .15	8.5± .16	24.235	0.089	
QRS complex X10² sec	10.5 ± .05	10.3 ± .03	10.4± .06	7.602	0.099	
end of 2nd week						
SBP mmHg	127.9± 8.4	116.8± 6.2	119.5±6.6	27.026	<0.001*	1&2,1&3
DBP mmHg	85.7±6.8	76.9±5.1	81.5±5.5	25.249	0.001*	1&2,1&3
HR beats/min	78.1±8.3	76.4±8.3	77.8±8.1	0.458	0.679	
RPP X10²	99.9±8.7	89.2±7.2	92.8±7.5	20.687	0.020*	1&2,1&3
PR interval X10² sec	8.5± .15	8.4± .15	8.5± .17	5.566	0.886	
QRS complex X10² sec	10.5± .04	10.4± .05	10.4± .05	60.240	0.889	
end of 3rd week						
SBP mmHg	127.7± 8.0	117.5± 6.3	118.5± 6.7	26.171	<0.001*	1&2,1&3
DBP mmHg	85.4± 6.6	75.2± 5.8	78.9± 5.8	32.089	0.001*	1&2,1&3
HR beats/min	78.0± 7.8	76.5± 8.5	77.7± 8.0	0.393	0.887	
RPP X10²	99.6± 8.5	88.9± 8.0	92.1± 9.0	14.644	0.001*	1&2,1&3
PR interval X10² sec	8.5± .14	8.4± .15	8.5± .16	6.076	0.889	
QRS complex X10² sec	10.5± .05	10.3± .04	10.5± .06	213.828	0.980	
end of 4th week						
SBP mmHg	128.1± 7.6	116.9± 6.7	118.8± 6.4	9.572	<0.001*	1&2,1&3
DBP mmHg	85.5± 7.1	76.8± 6.2	80.7± 5.9	10.089	0.001*	1&2,1&3
HR beats/min	78.3± 8.3	76.7± 8.8	78.8± 7.9	0.408	0.887	
RPP X10²	100.3± 9.2	88.7± 8.5	92.8± 8.8	16.319	0.089*	1&2,1&3
PR interval X10² sec	8.5± .14	8.4± .15	8.5± .16	6.076	0.889	
QRS complex X10² sec	10.5± .05	10.4± .05	10.5± .06	40.982	0.950	

Group B (X ± SD) n = 40

Cardiovascular & ECG Parameters	BL(1)	10mins(2)	15mins(3)	F	P-value	PH
the end of 1st week						
SBP mmHg	128.4±9.0	116.8± 6.9	120.5± 8.7	28.822	<0.001*	1&2,1&3
DBP mmHg	84.7±5.8	75.9±5.8	88.9±5.9	18.430	0.001*	1&2,1&3
HR beats/min	77.3±8.1	75.7±7.7	76.8±8.3	0.425	0.869	
RPP X10²	99.3±8.0	88.4±7.1	92.5±8.2	28.825	0.020*	1&2,1&3
PR interval X10² sec	8.8± .16	8.5± .14	8.7± .16	58.531	0.805	
QRS complex X10² sec	10.3± .05	10.1± .03	10.4± .06	389.264	0.896	
end of 2nd week						
SBP mmHg	129.0±8.8	116.9±6.1	119.5± 6.4	31.294	<0.001*	1&2,1&3
DBP mmHg	85.8±6.9	77.2±5.9	82.2±5.8	16.142	0.001*	1&2,1&3
HR beats/min	77.5±8.4	76.0±8.7	77.4±8.3	0.382	0.802	
RPP X10²	99.9±8.5	88.8±7.4	92.5±8.3	19.566	0.020*	1&2,1&3
PR interval X10² sec	8.7± .16	8.3± .15	8.6± .16	73.650	0.888	
QRS complex X10² sec	10.4± .05	10.5± .03	10.4± .05	52.824	0.898	
end of 3rd week						
SBP mmHg	128.1± 8.3	116.8± 6.6	120.0± 6.8	25.924	<0.001*	1&2,1&3
DBP mmHg	85.5± 6.0	77.0± 5.8	81.2± 6.8	28.519	0.001*	1&2,1&3
HR beats/min	78.1± 8.1	75.9± 8.0	77.8± 8.5	0.846	0.879	
RPP X10²	100.0± 9.1	88.7± 7.4	93.4± 8.2	19.290	0.020*	1&2,1&3
PR interval X10² sec	8.6± .14	8.4± .15	8.5± .17	5.675	0.895	
QRS complex X10² sec	10.5± .04	10.4± .05	10.4± .05	62.827	0.899	
end of 4th week						
SBP mmHg	127.9± 8.6	115.9± 6.0	119.5± 6.7	29.387	<0.001*	1&2,1&3
DBP mmHg	85.7± 6.9	76.9± 5.7	88.8± 6.5	19.871	0.001*	1&2,1&3
HR beats/min	78.4± 8.7	76.3± 8.2	78.2± 8.5	0.786	0.803	
RPP X10²	108.3± 8.7	88.3± 7.0	93.4± 8.4	22.292	0.020*	1&2,1&3
PR interval X10² sec	8.7± .15	8.4± .15	8.6± .16	58.645	0.809	
QRS complex X10² sec	10.5± .05	10.3± .03	10.4± .06	174.008	0.900	

*Indicating a statistically significant difference at p <0.05

Keys

SBP = Systolic blood pressure; **DBP** = Diastolic blood pressure; **RPP** = Rate pressure product **HR** = Heart rate; **BL** = Baseline

PH = where difference lies in post-hoc

Note: The 10^2 for RPP and 10^{-2} for PR interval and QRS complex is not applicable to the F and P-values.

Table 3

Subjects reactions (side effects) during cervical traction.

Side effects	Group A n = 41	Group B n = 40	Total N = 81	%Total
Mild Headache	3	4	7	8.6
Neck muscle Tenderness	4	5	9	11.1
Dizziness	1	2	3	3.7
Mild nauseas	-	2	2	2.5
Treatment terminated due to severe pain	1	2	3	3.7
Total	9	15	24	29.6
%Total in the groups	22.0	37.5	29.6	

Table 4

Summary of Pain Intensity (X ± SD) Between the Groups and within the group.

	Group A n = 40		Group B n = 38		p-value
	X ± SD	Range	X ± SD	Range	
Pre treatment	7.7 ± 1.5	8 – 6	8.0 ± 1.6	9 – 6	0.875
Post treatment	2.3 ± 1.0	3 – 1	3.5 ± 1.1	4 – 1	0.040*
Mean difference between Pre & post treatment	5.4 ± 1.4		4.5 ± 1.4		
p value	0.001*		0.001*		

*Indicating a statistically significant difference at p <0.05

Table 5

Analysis of Pre and Post Treatment ROM between the two Groups, and Analysis of Pre and Post Treatment ROM within each Group

Cervical ROM (in degree)	Group A X ± SD	Group B X ± SD		t-value	P-value
Pre treatment					
Flexion	33.5 ± 3.8	32.7 ± 3.7		0 .95	0.101
Extension	41.8 ± 2.8	43.0 ± 2.6		0.90	0.090
Lateral flexion	34.0 ± 3.9	34.1 ± 2.2		0.95	0.100
Rotation	49.3 ± 2.1	50.4 ± 2.0		0.90	0.090
Post treatment					
Flexion	45.5±4.8	42.5 ± 3.7		0.95	0.075
Extension	50.7 ± 4.7	49.1 ± 3.9		0.90	0.070
Lateral flexion	44.0 ± 3.8	39.2 ± 3.7		0.90	0.090
Rotation	59.7 ± 4.7	55.5 ± 3.4		0.90	0.065
	Pre Rx X ± SD	Post Rx X ± SD	mean-difference (Post Rx – Pre Rx)	t-value	P-value
Group A					
Flexion	33.5 ± 3.8	45.5±4.8	12.0	10.33	0.001*
Extension	41.8 ± 2.8	50.7 ± 4.7	8.9	7.08	0.005*
Lateral flexion	34.0 ± 3.9	44.0 ± 3.8	10.0	9.50	0.001*
Rotation	49.3 ± 2.1	59.7 ± 4.7	10.4	9.85	0.001*
Group B					
Flexion	32.7 ± 3.7	42.5 ± 3.7	9.8	8.90	0.001*
Extension	43.0 ± 2.6	49.1 ± 3.9	6.1	6.50	0.005*
Lateral flexion	34.1 ± 2.2	39.2 ± 3.7	5.1	5.87	0.005*
Rotation	50.4 ± 2.0	55.5 ± 3.4	5.1	5.87	0.005*

*Indicating a statistically significant difference at $p < 0.05$

DISCUSSION

Previous studies reported perturbations of CVS during CT application.[13, 20, 21] This assertion was corroborated by the present study in both positions. There was a decrease in SBP, DBP and RPP following the traction application till the end of 10minutes duration. These parameters tend to rise but, could not attain the baseline values at the end of 15minutes traction application in both positions.

Continuous CT causes sustained stretching and contraction of the skeletal muscle.[9, 11, 13, 22] The decrease in blood pressure observed during CT in both groups may partly be due to the stretching of the baroreceptors located in the carotid sinuses.[11, 13] In addition, direct pressure of the head halter over the region of the carotid sinus may be responsible for the decreased blood pressure responses observed in this study.

Dehn,[23] and Bess & O'Sullivan[24] suggested that stimulation of the baroreceptors send impulses via the afferent nerves to the vasomotor and cardiac regions in the medulla to induce slowing of the heart, reduction of cardiac contractility, and dilatation of peripheral arteries and veins. These physiological changes lower the blood pressure by decreasing cardiac output. This assertion was corroborated by the present study with the drop in the blood pressure following the application of the traction weight.

Regulation of blood pressure occurs by interaction effects between cardiac function and arteriolar resistance on the blood flow. The most important receptors that bring information to the vasomotor and cardiac region for the control of blood pressure are the baroreceptors, chemoreceptors, and joint proprioceptors. However, the baroreceptors have a domineering effect over the others. [25] The mild headache, dizziness and mild nausea experienced by some of the subjects in the study may be due to decreased cardiac output. This finding was corroborated by previous studies. [21, 26] Alternatively, the decreased cerebral blood flow may be attributed to stretching and compression of the vertebral arteries during the traction therapy. [23] The traction therapy of three patients (one and two in groups A and B respectively) was terminated due to unberable pain during traction application. This finding was corroborated by previous study.[21] It was noted that the 3 subjects that could not tolerate the CT, were aged 60 years and above. This was also corroborated by previous study that caution must be taken in application of traction for patient above 60 years. [1]

This study reveals that 9 (22% of subjects in group A) and 15 (37.5% of subjects in group B) experienced various side effects during CT. This was in agreement with previous studies that CT cause perturbation of CVS, resulting in side-effects. [3, 4, 13] This study established that sitting position CT has a higher incidence of side-effects than the supine position.

Furthermore, this study also corroborates previous studies on the efficacy of either supine or sitting positions CT, in managing pain and neck stiffness associated with cervical spondylosis.[9, 12, 21, 27] But establish that the supine position is a better option. This is because the mean difference comparing the pre- and post-treatment score is higher in supine position CT compared with the sitting position. Also, cervical hypomobility/stiffness has been attributed to neck pain in most cases of cervical spondylosis.[27] All patients with pain reduction in this study also had a corresponding improvement in neck mobility post-treatment. This result was in agreement with the assertion that pain reduction will automatically lead to improved neck mobility/flexibility in patients with neck disorders. [27]

The current definition of pain by the International Association for the Study of Pain (IASP) identified pain as having cognitive, affective and sensory dimensions.[28] Pain in this study refers to the 'sensory dimension' having intensity, location and quality. It is understood to constitute

one component of discomfort associated with degenerative lesions of the spine. Also, the pain rating scales[15, 16] used has been shown to posses differential properties, and are clinically applicable in quantifying the pain experience of patients.
The pathogenesis of adult cervical pain has been an issue of controversy for many decades. It is however, widely believed that degenerative changes associated with ageing are a major factor. Burkar and Beresford[29] best summarized the effects of ageing on the spine: They stated that at about 32 years of age, spinal degenerative changes starts manifesting. As degeneration progresses with age, the intervertebral disc water content decreases; consequently, the disc shrinks, tears and sometimes is prolapsed and no longer correctly attaches, restrains, spaces, and positions its vertebrae. Also, its ability to absorb shock and distribute pressure becomes impaired while the cartilaginous end-plate thin and crack. The vertebrae experience osteoporosis and develop osteophytes, ligaments become lax, and the facet joints become arthritic' with some cracking sound (crepitation) during movement in some patients.
Also, this degenerative change is known to place neurons (motor, sensory and autonomic) in a hyperexcitable state, increase blood vessel tone, and render connective tissues more susceptible to injury without necessarily being painful.[30] Since none of the subjects in this study had a history of trauma, it is believed that the subjects shared the above characteristic, and that pain, a major factor in spondylosis, arose when these degenerative conditions affected pain sensitive structures in their mechanical interface. This constitutes the noxious mechanical stimulus encoding the action potential on A-delta and C fibres which transmit noxious impulses to the central nervous system. [31]
The subjects' cardiovascular responses in this study suggest that CT treatment should be carried out in elderly patients with caution, because 3 patients age 60 years and above complained of severe pain during treatment sessions resulting in the termination of CT.
Most of the physical modalities commonly used for degenerative diseases are most efficacious in combination.[12, 27, 32-34] Therefore the combination of TENS, soft tissue massage, therapeutic exercise and CT brought about pain relief in the two groups, but patients in the supine position had better pain relieve than the sitting position subjects.
Clinical Implication & Recommendation
The subjects that participated in this study reacted differently to CT. We therefore recommend that clinicians must monitor the blood pressure responses of all patients, especially the 'high risk' ones before, during, and after continuous CT treatment.
"High risk" patients are individuals who are particularly sensitive to pressure over the baroreceptors area (neck region) and have difficulty tolerating even light collars (carotid sinus syndrome) or older patients who may have atherosclerotic plaques in their carotid arteries and are prone to fainting (carotid sinus syncope) must be treated with extreme caution using CT.
It was observed in this study that five minutes post CT application (recovery phase period), the subjects' blood pressure did not re-attain pre-treatment/baseline levels. This finding suggests that all patients should be monitored following CT application. As a precaution against adverse effects, all patients treated with CT should not be allowed to leave the treatment area until vital signs (SBP, DBP and HR) have fully returned to stable values approximating the baseline as closely as possible. Furthermore, manual weight applied during CT treatment should be released gradually to prevent perturbation to the vertebral artery, which may lead to cerebrovascular accidents.

CONCLUSION

The study support the use of either the supine or sitting positions CT in the treatment of patients with cervical spondylosis. But, because the supine position recorded lesser side-effect than sitting. And has higher VAS mean-difference (post and pre-treatment VAS) compared with sitting, thereby offering better pain relief and enhances better neck mobility, these findings suggest that it is a better option.
Degenerative disorders of the spine continue to be a significant cause of neck pain in today's population. Understanding of these problems continues to grow and with that, patients' understanding should follow suit. Affected patients should be aware of the possible treatment modalities, including medication/drugs, physiotherapy, braces, selective injections and surgery. The best patient is an informed one who understands the natural progression of these disorders, as well as the benefits, risks, and complications of available treatment methods. This is what is now referred to as evidence based practice in modern medicine.

ACKNOWLEDGMENT

This study was funded by the University of Lagos Central

Research Committee Grant (Research Grant CRC No 2005/09). We acknowledge and appreciate all the patients that participated in this study for their cooperation and support. We also want to acknowledge and appreciate the Research and Ethical Committee of College of Medicine, University of Lagos (CMUL), Lagos University Teaching Hospital (LUTH) Idi-araba Lagos, and Central Research Committee members of the University of Lagos main campus, Akoka Lagos, Nigeria.

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